Diversions

Definition

A diversion is a temporary ridge or excavated channel or combination ridge and channel constructed to divert concentrated and sheet surface water, and possibly subsurface water, from or around areas under construction or development, to sites where it can be used or disposed of.

Description and Purpose

Diversion structures consist of ridges or channels that are used to temporarily divert water around or from an area that is under construction or is being stabilized. Specific applications include perimeter control, diversion away from disturbed slopes, and diversion of sediment-laden water to treatment facilities.

The practice may also be called Interceptor, Berms, or Dikes

Pollutant(s) controlled:

- Suspended sediment

Companion and Alternative BMPs

- Riprap - Stabilized Outlet
- Rolled Erosion Control Products
- Seeding/Vegetation

Advantages and Disadvantages

Advantages:

- Reduces the volume of flow across disturbed areas, thereby reducing the potential for erosion.
- Breaks up concentration of water on long slopes.
- Maintaining a separation between clean water and sediment-laden water allows sediment basins and traps to function more efficiently.

Disadvantages:

- High flow velocities can cause erosion in the diversion structure.
- Diversion structures must be stabilized immediately after installation.
- Easily constructed with equipment found on most construction sites and thus often improperly designed

Location

Diversions are used where:

- Runoff from higher areas has potential for damaging properties, causing erosion, or interfering with, or preventing the establishment of, vegetation on lower areas.
- Surface and/or shallow subsurface flow is damaging sloping upland.

- The length of slopes needs to be reduced so that soil loss will be kept to a minimum.

General Characteristics

- **All diversions should be designed by a Licensed Professional Engineer**
- Areas above a diversion should be stabilized with other BMPs to prevent excessive sediment from accumulating in the diversion channel
- Channel dimensions should be adapted for the equipment that will be used to maintain the diversion.
- The length of the diversion is often fixed by the availability of stabilized outlets.
- To prevent scour or excessive seepage a stabilized outlet should be constructed

Materials

- Seed
- Rolled erosion control products
- Riprap

Design Specifications

- **Capacity**. Diversion channels designed to protect areas such as minor buildings and roads should have enough capacity to carry the peak runoff expected from a 25-year frequency, 24-hour duration storm. Diversions designed to protect major structures, homes, school buildings and high capacity roads should have enough capacity to carry the peak runoff from a 100-year frequency 24-hour duration storm.
- **Channel Shape.** The channel may be parabolic or trapezoidal in shape. The diversion must be designed to have stable side slopes. A ridge placed on the downstream side of the channel must be high enough to keep the runoff in the channel without overtopping. The ridge height should provide at least 6 inches of freeboard and a settlement allowance of 10%. The ridge shall have a minimum top width of 4 feet
- **Velocity.** Channel velocity shall not exceed what is considered non-erosive for the soil and planned stabilization. Table 1 shows maximum permissible velocities for vegetated channels. Rolled Erosion Control Products can be used in conjunction with vegetation to provide stabilization at increased velocities.
- **Channel Slope.** Runoff Diversion channels must be graded to prevent water standing long enough to drown vegetation in the channel. If possible design velocities greater than 1.5 feet per second should be used to avoid sediment accumulation in the channel. Steeply sloped channels that generate flow velocities greater than 2.5 feet per second will require some type of lining material other than vegetation.
- **Channel Lining.** Channel lining materials may include one or a combination of the following materials: vegetation, synthetic erosion control mats (ECM) or turf reinforcement mats (TRM), rock or concrete, as determined by a licensed Engineer.

- **Outlets**. Diversion channels must be able to deliver the runoff to a stable outlet, at a point where outflow will not cause damage. Some type of outlet structure or special lining over the outlet section of the diversion channel may be required

Construction Guidelines

1. All ditches or gullies shall be filled, and trees and other obstructions shall be removed before construction begins or shall be part of the construction.
2. If underground conduits are located under or through diversions, mechanical compaction, water packing, and installation and backfill of conduit trenches shall be made in advance to allow adequate settlement.
3. Diversion ridges constructed across gullies or depressions shall be compacted to a uniform grade to ensure proper functioning of the diversion.
4. Seeded areas need protection during establishment and will be mulched or covered with rolled erosion control products
5. Diversions must be completely stabilized prior to directing runoff to them.
6. Once soil is exposed for a diversion channel, it should be immediately shaped, graded and stabilized.
7. Vegetated diversions need to be stabilized early during the growing season (prior to October 1). If final seeding of diversions is delayed past October 1, other stabilization measures, such as rolled erosion control products or riprap may be required to stabilize the channel.

Monitoring

Inspect weekly and following each storm event.

Maintenance

- Remove debris and sediment from the channel and rebuild and stabilize the ridge as needed.
- Check outlets and make necessary repairs immediately.
- If sediment traps are used as a performance enhancer, remove sediment from traps when they are 50% full.
- When the work area has been stabilized, remove the ridge and fill in the channel to blend with the natural ground. Remove temporary slope drains and stabilize all disturbed areas with vegetation or other erosion control practices.

References

Maine Erosion and Sediment Control BMP, 3/2003. Water Diversion
Dyersburg, Tennessee Erosion Control Handbook. Diversions

Table 1:

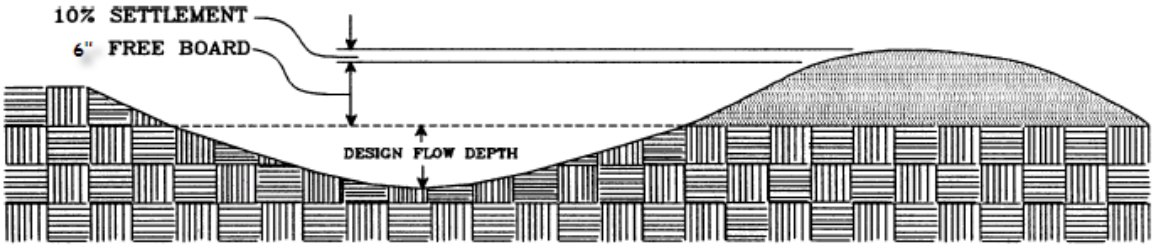
Diversion Maximum Permissible Design Velocities

Soil Texture	Retardance and Cover	Permissible Velocity (ft / second) for Selected Channel Vegetation
Sand, Silt, Sandy loam, silty loam, loamy sand (ML, SM, SP, SW)	C-Kentucky 31 tall fescue and Kentucky bluegrass	3.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	2.5
Silty clay loam, Sandy clay loam (ML-CL, SC)	C-Kentucky 31 tall fescue and Kentucky bluegrass	4.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	3.5
Clay (CL)	C-Kentucky 31 tall fescue and Kentucky bluegrass	5.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	4.0

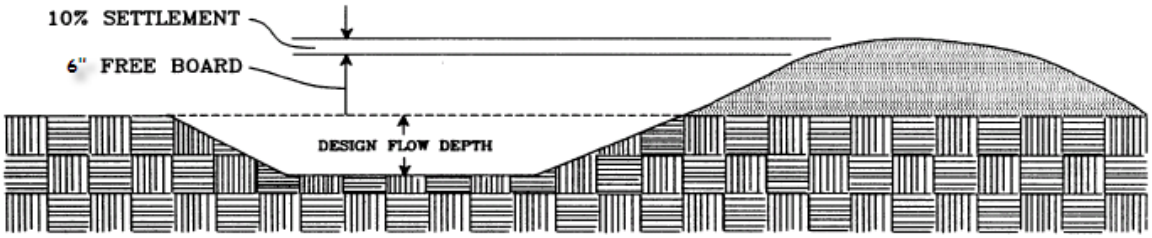
1 Annuals—Use only as temporary protection until permanent vegetation is established.

Exhibit 1:

Typical Diversion Cross-Sections



Typical Parabolic Diversion



Typical Trapezoidal Diversion